RECYCLING OF HAZARDOUS MATERIALS AT MCCLELLAN AFB UNDER A RCRA EXCLUSION

Donald K. Gronstal
Pollution Prevention Program Manager
SM-ALC/EMP
5050 Dudley Blvd., Suite 3
McClellan AFB, CA 95652
(916) 643-3672 (x329)
gronstal.don@email.mcclellan.af.mil

Craig R. Burnett
Senior Chemist
National Technical Systems
P.O. Box 857
North Highlands, CA 95660
(916) 779-3106
craigb@ntscorp.com

Kevin J. Williams, Ph.D.
Senior Chemical Engineer
Radian International LLC
10389 Old Placerville Road
Sacramento, CA 95827
(916) 857-7403
kevin_williams@radian.com

Abstract

McClellan Air Force Base (AFB) has obtained written approval from the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) to recycle certain hazardous materials under exclusions from federal and state hazardous waste regulations. Specifically, DTSC has concurred that the Seiler High Temperature Vitrification process can be used to recycle three types of waste: steel mill dust, garnet blast media residuals, and industrial wastewater treatment sludge generated at McClellan AFB. The proposed recycling qualifies for exclusion under 40 Code of Federal Regulations (CFR) 261.2(e) and (f), as well as California Health and Safety Code 25143.2(b). The approval clears the way for McClellan and other DoD installations to recycle hazardous materials (without hazardous waste permits) that are currently being disposed of as hazardous waste, thereby reducing costs and long-term liability.

Several points were key in obtaining approval. Bench-scale and pilot-scale studies demonstrated that the wastes can be successfully recycled into non-toxic, commercial glass/ceramic products, such as abrasives, roofing tile granules, and architectural materials. Detailed chemical and physical characterizations showed that the wastes contained components essential to producing acceptable products, and that materials were not being burned for destruction or for energy recovery. Additional technical information was provided to DTSC to show that wastes were not being "reclaimed," and that recycled products would not be used "in a manner constituting disposal."

In granting approval of the recycling exclusion, DTSC has also established the mechanism through which detailed information on other wastes can be reviewed and approved, if appropriate, for the recycling exclusion. Wastes containing silica and/or transition metals, with low organic content, are suitable for vitrification. The work done by McClellan AFB has laid the groundwork for recycling a multitude of suitable materials from DoD installations as well as private industry.

Background

McClellan Air Force Base, together with Radian International LLC, has explored the potential for vitrification technology to recycle several materials currently being disposed of as hazardous

waste. Such an approach has three main benefits:

- Recycling hazardous wastes into marketable products diverts hazardous wastes from landfills and incinerators.
- Long-term liability associated with conventional disposal methods is eliminated.
- Recycling can be accomplished at a lower cost than for treatment/disposal.

Federal and California state hazardous waste regulations offer exclusions for materials that are recycled, meaning that such materials are not regulated as hazardous waste, and that the recycling facilities are not regulated as treatment facilities. An exclusion makes the technology easier to apply, because hazardous waste permits are not required. However, there are several criteria that must be satisfied before a recycling operation can be considered excluded.

Regulatory Requirements

The requirements to be satisfied for a recycling exclusion are stated in nearly identical language in both the federal[1] and state of California[2] regulations. The key regulatory requirements are:

- The recyclable material must be "used or reused as an ingredient in an industrial process to make a product."
- The materials must not be "reclaimed," that is, the process must not separate desirable constituents from undesirable constituents.
- The materials must not be "used in a manner constituting disposal or used to produce products that are applied to the land."
- The materials must not be "burned for energy recovery, used to produce a fuel, or contained in fuels."
- The materials must not be "accumulated speculatively."

Seiler High Temperature Vitrification Process

The High Temperature Vitrification Process, developed by Seiler Pollution Control Systems, Inc., has been evaluated for application at McClellan AFB. High-temperature vitrification is the process of converting materials into glass by heat, fusion, and cooling. The Seiler system uses a high-temperature (>1500°C) molten bath to convert suitable hazardous materials into a glass/ceramic product. In the process, the inorganic constituents are incorporated into a silicate matrix, making heavy metal contaminants virtually unleachable. The vitrified product has chemical and physical properties suitable for commercial use as medium-grade abrasives, roofing granules, architectural materials, or insulating materials.

Feed materials are blended together into formulations that, when vitrified, make products with the desired properties. Hazardous wastes containing silica and/or transition (heavy) metals are suitable for recycling by the Seiler process.

Gaining Agency Approval

In January 1997, a formal request was submitted to the California Department of Toxic Substances Control (DTSC) by McClellan AFB for approval to recycle waste materials using the Seiler process. (DTSC has the authority for administering hazardous waste regulations in California.) The request included a detailed analysis of the regulations, together with specific evidence showing how the proposed recycling operation would meet those requirements. Follow-up discussions were held with DTSC during their review, and technical issues were discussed in detail over the next several months. Finally, in September 1997, DTSC issued a letter of concurrence, stating that three waste streams – steel mill dust, garnet blast media residual, and McClellan's industrial wastewater treatment sludge – can be recycled using the Seiler process under exclusion from hazardous waste regulations.

Several points were key in obtaining approval. First and foremost was to demonstrate that the requirement for the material to be "used or reused as an ingredient in an industrial process to make a product" is satisfied. Physical and chemical characterizations performed during bench- and pilot-scale testing were used to prove that waste materials could be successfully transformed into products with commercial value, such as abrasives, roofing granules, and architectural materials. Product specifications were shown to be satisfied, and letters from potential buyers of the product demonstrated its commercial value.

The issue of materials being "reclaimed" was important in the determination. Although the Seiler process does separate constituents into distinct products, it is virtually impossible to vitrify commonly encountered waste materials without reducing mass through the evaporation of water, release of carbon dioxide from the decomposition of carbonates, or the oxidation of organic compounds. DTSC did not set specific criteria to be met on this issue, instead preferring to approve waste streams on a case-by-case basis. Acceptable materials should be composed primarily of inorganic compounds which have been shown to be essential to the formation of acceptable products, with low levels of organic compounds (especially regulated organic compounds). The general guideline is that the process should be used primarily to recycle the material, not to destroy significant quantities of undesirable organic compounds. In addition, DTSC has established a limit on the thermal value of recyclable materials of 5,000 Btu/lb to ensure that materials are not burned for energy recovery.

Under the recycling exclusion, materials cannot be recycled into products that are applied to the land (such as road base). Because Seiler has developed specific applications for the vitrified product, this requirement is easily met. Products such as abrasive materials, roofing granules, and architectural materials do not involve land application.

Recyclable materials cannot be "accumulated speculatively," that is, they must not be stockpiled to wait for a market to develop or to wait for more favorable market conditions. Seiler has been

able to demonstrate, using letters from abrasive manufacturers and other interested companies, that there is a market for the vitrified product. In addition, operational restraints can be put into place such that materials are not stockpiled for speculative purposes.

Framework for Future Recycling

In obtaining DTSC's concurrence for the recycling exclusion, McClellan AFB has established the framework for recycling wastes through vitrification. A multitude of materials from other DoD installations as well as private industry are suitable for vitrification. Detailed data on additional waste streams will be submitted to DTSC so that the list of acceptable materials can be expanded. Other state agencies may be able to follow DTSC's precedent in approving recycling exclusions for the Seiler process. In the future, Seiler intends to install full-scale vitrification systems in the United States so that the benefits of this recycling technology can be realized.

References

1. *Code of Federal Regulations*, Title 40, Part 261.2.

2. *California Health and Safety Code*, Section 25143.2.